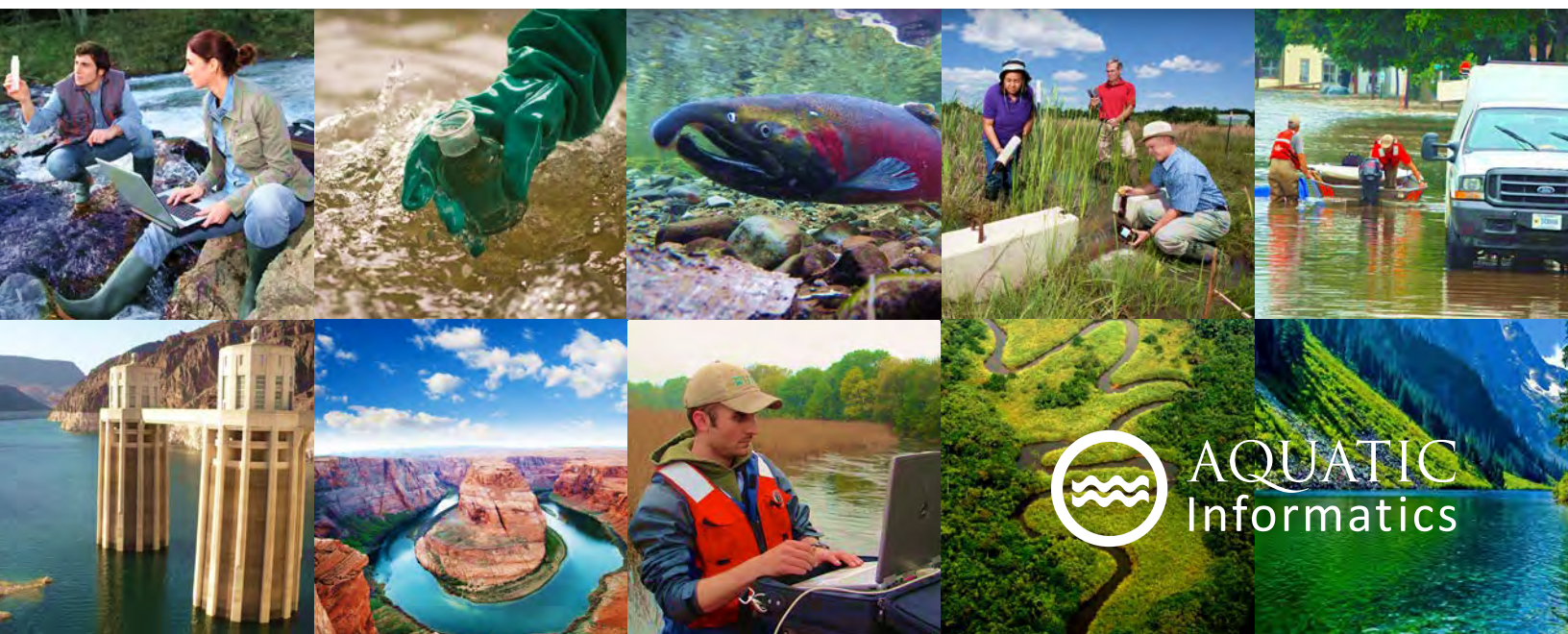




EXECUTIVE GUIDE

5 Reasons to Modernize Water Data Management

A Wise Investment in Timely, Accurate,
Defensible Water Knowledge



AQUATIC
Informatics

A group of seven children are standing on a wooden dock over a pond. They are all holding fishing rods and appear to be fishing. The children are dressed in casual summer clothing. The background shows tall green reeds and a calm body of water reflecting the sky.

"AQUARIUS enabled consistent processes and procedures to be replicated state-wide to manage sampling workflow, collection of field data, and integration of laboratory results. Furthermore, consistency with data management facilitated reporting of drinking water, wastewater, and groundwater data to staff, improving efficiency, and accuracy in monitoring performance of assets and making water management decisions."

Donna Hollis
Data Quality & Systems Analyst



Executive Summary

Discover why government agencies need AQUARIUS to empower decision makers.

Government agencies are responsible for allocating and protecting water resources across vast geographic regions to serve growing populations of citizens, while safeguarding, restoring, and enhancing natural environments. Having the right information about water quality and quantity is critical to effectively administer water permits, comply with federal laws, set and enforce state regulations, defend rights to interstate waters, plan for climate change, protect endangered species, and support a thriving economy.

Water monitoring is an essential public service.

Agencies must also empower all their stakeholders, both public and private, with timely access to the right information at the right time to encourage cooperation towards the right social, urbanization, and environmental actions. Evidence-based policies, planning, engineering design, and green solutions are required to optimize all decisions to improve watershed outcomes.

Over 500 of today's agencies rely on AQUARIUS to generate the vital insights required for the integrated and sustainable management of their water resources.



Comprehensive water planning requires both effective environmental monitoring & *data-to-information-to-knowledge* management to empower decision makers.

Government agencies are collecting vast quantities of water quality and quantity data. They are making deep investments in continuous water monitoring networks and critical water sampling programs to generate the data and metadata required to understand the state of water resources for aquifers, rivers, streams, lakes, and reservoirs. This unprecedented growth in environmental data and metadata volumes is placing unanticipated loads on fragile systems not designed to support current best practices. Modern environmental data management systems are designed to support a concept we refer to as *data-to-information-to-knowledge* management.

According to the DIKW hierarchy, “information is defined in terms of data, knowledge in terms of information, and wisdom in terms of knowledge¹.”

Does 100% of Your Data Support Effective Water Resource Decisions?

In a survey of 25 million nutrient records from 488 different agencies collected in the United States since 1899, Sprague et al. (2017) discovered that “nearly 14.5 million of these records had missing or ambiguous information for one or more key metadata elements, including (in decreasing order of records affected) sample fraction, chemical form, parameter name, units of measurement, precise numerical value, and remark codes.” The direct loss of value as a result of this ambiguity is estimated at US \$12 billion relative to the US \$8.2 billion value of the properly curated data.

1 | Rowley, Jennifer (2007). "The wisdom hierarchy: representations of the DIKW hierarchy". Journal of Information and Communication Science. 33 (2): 163–180.

To ensure environmental monitoring investments can support wise decisions, forward-thinking agencies are making investments in modern water data management software. A modern data management solution speeds data work-up, prevents wasted trips into the field, and maximizes the use of tax dollars across your organization so you can achieve your program goals and mission.

Water data, in raw form, are too complex, dispersed, and arcane to support decision makers towards favorable watershed-scale outcomes. Water data are a strategic asset that must be managed over a full life-cycle, from initial requirements scoping to delivery of primary-use information, but also inclusive of curation to meet future needs. Without the right platform, data of varying quality remain stranded in multiple applications – including spreadsheets, LIMS, SCADA, various instrument software, or aging custom systems that are falling behind hydrological and technological industry standards. These disparate systems introduce errors and data silos that result in costly inefficiencies. For data to support better, timely decisions, the data must be structured to reveal the truth while concealing unneeded complexity.

To achieve a greater return on investment on monitoring instrumentation – and to meet program mandates and goals – raw environmental data must be proficiently *aggregated* and *processed* into information and knowledge.

Effective *data-to-information-to-knowledge* management is needed to reduce risk and ensure that wise decisions prevail. To inform the right course of action, environmental data must be efficiently: centralized and protected, systematically quality controlled for accuracy, validated and graded, aggregated and calculated, visualized and reported, shared and accessible.

Government officials must make innumerable decisions for the optimal use and protection of water ... every day, every month, every year. This Executive Guide outlines how a modern platform – like AQUARIUS – can empower water professionals with timely and meaningful water knowledge to protect people, economies, and the environment.

Explore 5 reasons your agency can benefit from modernizing to AQUARIUS:



Water knowledge reduces real risks



50% efficiency gains boost professional productivity



Real-time insights support wise water resource decisions



High quality data builds trust in your agency



A modern, intuitive solution attracts top talent

01

02

03

04

05

"Continuous storm water monitoring is about risk management. Municipalities can use real-time data for quick responses to illicit discharges, for flood modeling, and for calculating the contributions to total pollutant loads."

James Riddle, Project Manager, Woolpert



01 Water Knowledge Reduces Real Risks

Water is central to our prosperity. When water is scarce during droughts, or quality is compromised from spills or harmful algae blooms, or floods result in catastrophic damage, the economic impact of water becomes blatantly apparent to affected citizens and industries. With growing populations, increased threats of pollution, and aging infrastructure, it is more critical than ever to reduce risks associated with impaired water quality and availability.

The impact of water today is measured in the billions of dollars. Making wrongful assumptions about the quality or quantity of water in providing for essential public services can be costly.

Environmental Risks \$\$\$\$\$

Economic Risks \$\$\$\$

Legal Risks \$\$\$

Effective information management can help mitigate millions of dollars in risk exposure. Knowledge empowers government agencies to effectively

manage the risks of regulatory fines, legal action, engineering infrastructure mishaps, unplanned extreme environmental conditions, and health hazards. It can ensure the equitable distribution of safe water supply for maximum social, economic, and environmental good. Greater intelligence about water ecosystems can help economies thrive.

"Given the high cost of ignorance, a sustainable supply of relevant, reliable, and trustworthy water information is essential – and good insurance – to ensure the wise use of limited public funds for a secure water future." – Stu Hamilton, Senior Hydrologist, Aquatic Informatics

Real risks that impact safe water supply and support human life are carefully managed everyday by government agencies who rely on the AQUARIUS platform. Threats to freshwater resources are avoided or mitigated. Preparation for, warning of, and response to droughts, floods, and harmful water quality events are improved. More water can be made available where it provides the best economic value.

What's the Cost of Not Finding Information?



Workers spend **2.5 hours** or **30%** of the day searching for information



An enterprise with 1,000 knowledge workers wastes
\$48,000/wk or \$2.5 million/yr
 due to an inability to locate and retrieve information

76%



of company executives consider information to be **"mission critical"** & their company's more important asset

60%



felt that **time constraints & unclear organization** were preventing employees from finding the info they needed

30 - 50%



of the information available within an enterprise is **NOT centrally indexed**



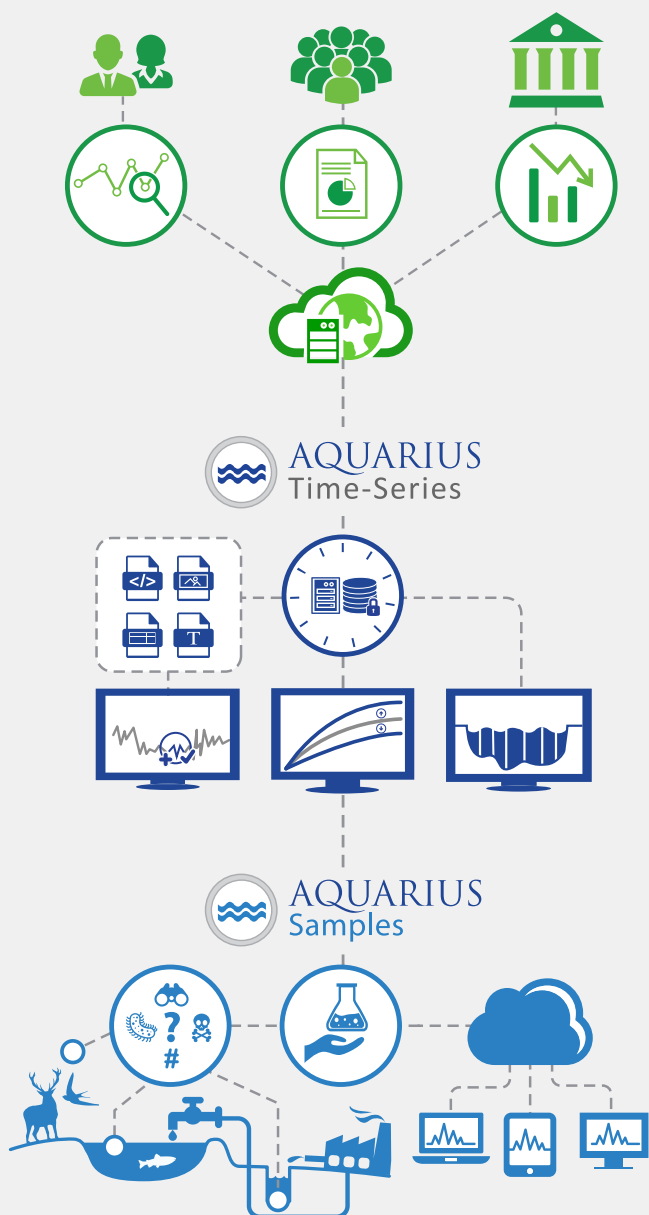
02 50% Efficiency Gains Boost Professional Productivity

People, processes, and platform are critical to operational excellence. While government agencies employ the best educated hydrologists, water quality specialists, scientists, engineers, and field technicians to monitor water, the right platform is also required to empower them to standardize and streamline information production processes.

Data overload is a real and costly problem. Most water professionals are spending too much time trying to find and produce meaningful, actionable information. While data volumes are overwhelming... information often remains elusive.

IDC reports that "the knowledge worker spends about 2.5 hours per day, or roughly 30% of the workday, searching for information" ([IDC Whitepaper: The High Cost of Not Finding Information](#)). Given that water professionals are managing massive volumes of environmental data (exponentially larger than office data managed by the average knowledge worker), this challenge is compounded for our industry.

In this era of Big Data, a highly scalable platform is vital to provide water professionals with the processing power they need to complete large data management tasks and to solve highly complex water challenges. A modern, integrated platform is essential for government agencies to achieve their mission within fluctuating budgetary cycles.



"With over 400 gaging sites collecting data in all corners of Wyoming, the time savings in records reduction has been well worth the investment. We have realized about a **50% time savings across the board**, freeing up valuable limited staff time for other important work ... By also employing the AQUARIUS WebPortal to serve up near real-time data to our field staff as well as the public, fact-based decisions can be made on the fly with confidence."

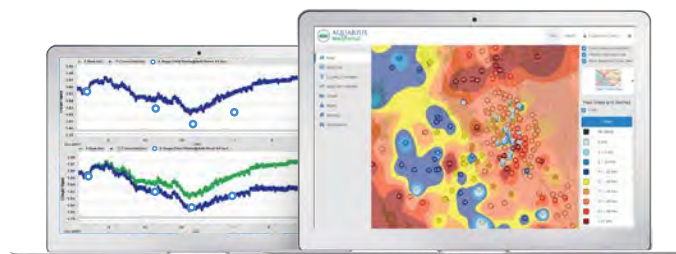
Loren Smith
Superintendent of Water Division III
Wyoming State Engineer's Office



AQUARIUS is a modern platform that delivers timely insights into your water data.

AQUARIUS is the leading software solution to acquire, process, model, and publish water data. National monitoring agencies across the globe have adopted the AQUARIUS platform, designed to fully scale to provide the same tools and processing power to regional government organizations. Decision makers are empowered to make faster, transparent, and defensible data-driven decisions. They can likewise publish accurate water data online to meet the evolving expectations of data consumers for anytime, anywhere access.

Government agencies that adopt AQUARIUS are rewarded with upwards of 50% efficiency gains. They reap all the advantages of a modern platform designed to support the latest industry best practices – a solution that is configurable to their standardized operating procedures to improve data consistency, comparability, and reliability agency-wide.



8 Ways AQUARIUS Drives Efficiency Gains for Rapid ROI

CENTRAL ACCESS – AQUARIUS centralizes vast volumes of field measurements, sample lab results, time series data, and river gauging measurements from across your organization for quick and easy access. Data previously dispersed across offices, systems, and staff computers are centrally secured allowing staff to find meaningful trends and relationships across different data sets.

01



AUTOMATIC DATA IMPORTING – Flexible importing enables users to rapidly enter field or lab results, automate telemetry imports, and integrate AQUARIUS with external sources. New data can be automatically processed in near real-time, saving hours of work daily.

02



FINDABILITY – Using a centralized system eliminates time wasted “searching” for data (which, per the *IDC Whitepaper: The High Cost of Not Finding Information*, accounts for 30% of the workday). AQUARIUS users apply powerful filters to instantly zero in on the information they need, enabling new hires to find data as easily as veterans within your organization.

03



POWERFUL CALCULATIONS & FLEXIBLE PROCESSING – AQUARIUS automates complex computations, such as discharge derivation, evapotranspiration, or sediment loads. Calculations can be chained together to solve complex water problems specific to your organization’s mission. Powerful, fast data processing delivers timely insights.

04



VISUALIZATION – AQUARIUS delivers advanced, responsive analytics for evaluating and visualizing large volumes of data. Maps, graphs, and charts provide the complete environmental picture, empowering users to instantly spot outliers, identify trends, and make impactful decisions.

05



WARNINGS & ALERTS – AQUARIUS automatically flags data outside of acceptable ranges that need immediate attention. Network health indicators, quality control flags, and metadata diagnostics prevent unnecessary trips into the field.

06



EXTENSIBILITY – AQUARIUS eliminates time spent exporting, importing, and amalgamating data from various systems. Rich and modern web service APIs make it easy to integrate AQUARIUS with existing systems, data acquisition tools, data repositories, or business intelligence (BI) tools.

07



STREAMLINED REPORTING – When data are dispersed or platforms are inflexible, regular operational reporting and annual regulatory compliance reports can take days, or weeks to prepare. With AQUARIUS, instant reports, web publishing, and open integration with BI systems streamline report publishing, enabling agencies to realize significant labour productivity gains.

08



Powerful, Configurable
Reports

Online Portal &
Interactive Dashboards

Real-Time Alerts
& Warnings



03 Real-Time Insights Support Wise Water Resource Decisions

Government agencies responsible for water resources must manage and analyze water data on a *big* scale. A modern system transforms environmental data into a highly valuable asset – unlocking the enormous potential for increased transparency. Environmental water, drinking water, and wastewater are linked through the water cycle, and data points across the cycle have the power to change the way water is managed.

With the AQUARIUS platform, authoritative reports, visually rich online dashboards, and automated alerts simplify knowledge access and dissemination to ensure that timely insights can empower wise water use to balance local, state, industrial, agricultural, and environmental objectives. Government agencies are better able to measure and inventory water supply, optimize storage, evaluate conservation efforts, forecast future water demands, and respond quickly to emergencies.

The insights gained with AQUARIUS empower water monitoring agencies to better allocate the use of public funds.

Water quality insights are used to identify impaired water bodies and establish water quality goals. A precise understanding of the true sources causing

environmental issues enables agencies to implement projects to restore and protect water resources, efficiently solving the most complex challenges. The AQUARIUS platform, by measuring program success, confirms the efficacy of efforts towards the integrated and sustainable use of water resources, all the while streamlining regulatory compliance.

“TasWater’s data users can quickly access water quality data across the state to view performance statistics, trends, and identify problem areas across the 76 drinking water systems and 111 sewerage systems. The reports were used in the first TasWater Annual Drinking Water Quality Report, which received outstanding praise from the regulator and senior management team for its demonstration of in-depth system analysis.”

Donna Hollis,
Data Quality & Systems
Analyst, TasWater





"Since purchasing AQUARIUS Time-Series in 2008, we have dramatically **increased the accuracy and quality** of our stream gaging network statewide. Creating a reproducible, archiveable, legally defensible record – and being able to publish that record to USGS standards, which is the national standard for us – that's the big plus. Our water data are frequently used in lawsuits and cases, from the State Board of Control to the Wyoming Supreme Court and even in the U.S. Supreme Court. In a litigation situation, we know we can call upon the correction history and audit trail that's saved in AQUARIUS."

Loren Smith
Superintendent of Water Division III
Wyoming State Engineer's Office



04 High Quality Data Builds Trust in Your Agency

You want water you can trust. Your stakeholders want real-time data they can trust. Yet, continuous environmental data and records from remote water monitoring stations can contain anomalous or erroneous data that are confusing or misleading for end-users of the data. To produce the highest quality published data, and ensure that the data are fit for purpose with meaningful metadata, all data require systematic review for error detection and correction.

AQUARIUS includes a unique portfolio of features for real-time sanity checking, error detection, data cleaning, data flagging, automatic bias correction, and data validation. Automated procedures eliminate the majority of tedious manual data workup processes. Role-based access defines what actions users are able to perform (like read, edit, or approve data) based on their assigned roles, allowing for

greater control over data security and workflows. While AQUARIUS maintains a permanent record of original data, an automatic audit trail tracks corrections, processing, notes, and remarks for highly defensible published data.

By automating quality assurance and quality control activities, agencies can produce real-time data that decision makers can trust, while freeing up time for higher value analysis.

Government agencies, like the USGS, rely on AQUARIUS to process data from "gage to page" in one minute! They prefer AQUARIUS for producing timely water information of the highest quality, earning the highest confidence from their stakeholders.

"The Aquatic Informatics team has played an important role in helping us to develop our network and systems for management of water quantity and quality. With their knowledge, they have helped us conceptualize and implement the types of reporting and forecasting that we believe best suits our target audience and customers. As well as all of that, the team in general is helpful and positive about wanting to see us get the best out of our data and sites."

Micah Dodge, Catchment Data Technician, Horizons Regional Council



horizons
regional council



05 A Modern, Intuitive Solution Attracts Top Talent

Some agencies are finding it challenging to attract, train, and retain qualified staff who can consistently and efficiently process water data in accordance with standard operating procedures. For agencies that rely on AQUARIUS, building and engaging the best teams is greatly simplified. Comprehensive deployment, training, and support resources guarantee a smooth transition to modern *data-to-information-to-knowledge* management best practices.



Using the #1 platform attracts top minds.

Thousands of water professionals are experienced with AQUARIUS. Using the same platform helps attract and retain the brightest talent in the industry.

Onsite & online training speeds onboarding.

Onboarding new staff is simplified. The modern interface minimizes training time to days, while onsite and online training resources and courses accelerate ramp-up time.

Specialists offer world-class support.

Everyone needs a little help sometimes. Aquatic Informatics has a world-class team of dedicated experts renowned for helping with questions and challenges as they arise.



150 years of
historical data

1,000,000+
time series



16,500
active real-time
gaging sites



3,000
AQUARIUS
licenses

"One word sums up what AQUARIUS Time-Series has allowed us to do with the sheer volume of data we collect. POSSIBLE! Without AQUARIUS, it would not be possible to process, analyze, and graph the data we collect across the state of West Virginia. AQUARIUS Time-Series is allowing us to expand our network of continuous instream monitors. Each year we are adding 5 or more stations to monitor streams whose water quality shows high flux in such parameters as pH, specific conductance, and dissolved oxygen. As the data management continues to get easier with AQUARIUS Time-Series, we are effectively adjusting the now available time. As I eluded to at the beginning: we would be lost without AQUARIUS."



Nicholas Murray,
Resource Supervisor,
West Virginia DEP

AQUARIUS will expand with your network.

AQUARIUS can manage Big Data – processing high volumes of data that arrive from hundreds to thousands of sensors at a high velocity and in a wide variety of formats. There is no practical limit to the length of a time series and no limit to the number of time series. As their monitoring networks grow, government agencies can rely on the same platform to support their larger networks. AQUARIUS is the most modern and powerful platform for managing water data for agencies of any size.

Partner with an award-winning company.

By choosing Aquatic Informatics, your agency is partnering with great people – dedicated to

delivering award-winning solutions – who have built an award-winning culture and business. Your agency is making a safe investment in a company that is continually growing and innovating to meet your evolving needs.





Need more funding?

Read Stu Hamilton's eBook for persuasive cases sensitive to local politics and priorities to help close your funding gap – the benefits far outweigh investments in water monitoring.

GET FREE EBOOK

“Making wrongful assumptions about the quality or the quantity of water in providing for essential public services is expensive. A sustainable supply of relevant, reliable, and trustworthy hydrological information is essential to ensure the wise use of public funds.” – Stu Hamilton, Senior Hydrologist



Ready to talk?

Book a FREE consultation today! We would like to learn about your water monitoring program and to discuss how AQUARIUS can support better, faster water decisions.

BOOK CONSULTATION

Aquatic Informatics Inc.

2400 – 1111 West Georgia St, Vancouver, BC
1.877.870.2782 | +1.604.873.2782

Aquatic Informatics USA Inc.

1465 Slater Rd, PO Box 5007, Ferndale, WA
1.877.870.2782

Aquatic Informatics Australia Pty Ltd.

Level 5 / 18 Elizabeth Street, Hobart, TAS
+61.3.6272.2229

info@aquaticinformatics.com
www.aquaticinformatics.com

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